

NOISE POLLUTION CAUSED BY ELECTRIC GENERATORS AND FIRING OUTSIDE MARRIAGE HALLS IN LAHORE: A SENSITIVITY ANALYSIS USING CONTINGENT VALUATION

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ABSTRACT

This study is based on evaluating the average willingness to pay and average willingness to be compensated for the negative externality; noise pollution caused by electric generators and firing outside marriage halls. The electricity shortfall in Pakistan has led the country to move towards energy alternatives and use of electric generators has become a massive phenomenon in recent times. Extensive use of generators has caused noise pollution in many parts of the country. Moreover, firing outside marriage halls is also found to be a negative externality for residents near marriage halls. This study is primarily related to two residential locations of Lahore (Iqbal Town and Model Town) and two commercial locations (liberty market and hall road) within the city. The methodology that has been adopted is the contingent valuation survey. Questionnaires were filled from residents in residential locations and shopkeepers from commercial locations. The results revealed that the average willingness to be compensated for noise pollution caused by generators was greater than the average willingness to pay. On the other hand, similar findings were achieved in case of firing outside marriage halls where average willingness to be compensated exceeded average willingness to pay if externality was internalized.

KEYWORDS: Average Willingness to Pay, Average Willingness to be Compensated, Contingent Valuation and Noise Pollution

INTRODUCTION

Presently, Pakistan is experiencing the most violent years of the history where economic problems combined with many socio-political problems have affected the performance of the economy adversely. Unemployment, inflation, political instability, low levels of productivity and investment, bribery, broken down law and order, corruption, mismanagement and underutilization of resources are some of the factors responsible for Low GDP growth rates and under-development of the country.

Research Problem

The problem that is common in developing countries is noise pollution. Regional disparities and underdevelopment has led to urbanization and congestion in many cities. Despite those typical socio-political and economic factors mentioned above, there are certain factors which are acting as a constraint to efficiency in our routine activities. For instance, noise pollution caused by vehicles (Rickshaws and trucks) on the roads and firing outside the

banquet halls is a cause of disturbance for houses located in the vicinity of roads and marriage halls.¹ Energy crisis has not only led to a diversion of resources from the productive use but it has also produced a negative externality through the unwanted sound of electric generators in various parts of the country including residential and commercial areas. The country has paid huge amounts in the purchase of electric generators ever since the problem of load shedding began. The country has not only been using domestically manufactured generators but there is now a sea of imported generators available in the market.

Use of electric generators has created a problem of noise pollution in different parts of the country. People have started using domestic, industrial and commercial generators to overcome the problem of energy but the unwanted sound produced by electric generators has created a problem of non-exclusion and market failure in the economy. Last year, according to the National Environment Quality Standards (NEQS), the limit for noise in residential areas was set at 55 decibels during the day and 45 db during the night. Currently, there is no active and coherent policy adopted to tackle the problem of noise pollution. According to a senior research officer for air quality at the Environment Protection Department; Diesel generators generate 88db of noise, while generators running on petrol or gas generate above 95db and noise above 85db is physically painful (Alam, 2011). He also said that there were no laws regulating the use of generators and some houses install industrial generators of up to 15 KVA, which cause more noise and air pollution. Thus, this paper would primarily focus on the externality caused by the use of electric generators i.e. noise pollution.

People living near commercial areas have to hear the continuous but unwanted sound of electric generators during the hours of load shedding. In the darkness of load shedding, the unwanted sound of generators and firings outside marriage halls is a cause of headaches for many. I believe that the sound of generator is more annoying than the sound of radio, television and phonographs.

Objectives

- To know the social costs in terms of human health problems related to noise pollution(e.g. noise induced loss of hearing, restlessness and sleeping problems, headaches and migraines, decrease in the efficiency in working, blood pressure, fatigue and increased stress levels etc.). Moreover, noise indirectly weakens the edifice of buildings, bridges and monuments. It creates waves that can be very dangerous and harmful and put the building in danger condition.
- What are different types of noise pollution in people's view?
- Compare the willingness to pay of people living in noisy area for lower environmental disturbances caused by generators and firing outside marriage halls.
- The study will come up with the impacts of excessive noise pollution on human health so it will help policy framers to take serious action against violators.

METHODOLOGY

Since people are not making adverse expenditures to avoid damages done from noise pollution e.g. people are not found buying ear plugs etc. to avoid the unwanted sound of generators. However, people might be using aspirin and other

¹Rikshaws are local vehicles in Lahore.

tablets to treat themselves against the damage caused by noise pollution. The methodology that this study will employ is ‘**Contingent valuation**’ (S. V. Ciriacy-Wantrup (1947) to value the costs and benefits related to this specific externality.² Contingent valuation helps in valuing an environmental problem as highlighted in this study. A sample of 20 was selected and a survey was conducted in residences near commercial areas and housing near marriage halls. The respondents were asked to rank the most important local environmental effect of noise pollution. This study is primarily related to two residential locations of Lahore (Iqbal Town and Model Town) and two commercial locations (Liberty Market and Hall Road) within the city. Twenty questionnaires were filled from residents in residential locations and shopkeepers and owners from commercial locations.

RESULTS

The overall results revealed that the average willingness to be compensated for noise pollution caused by generators was greater than the average willingness to pay. On the other hand, similar findings were achieved in case of firing outside marriage halls where average willingness to be compensated exceeded average willingness to pay if externality was internalized (refer to figure 1 and figure 2).

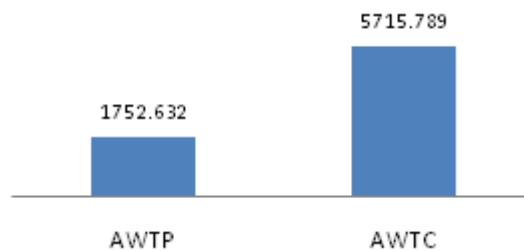


Figure 1: Comparison of AWTP and AWTC for Generators

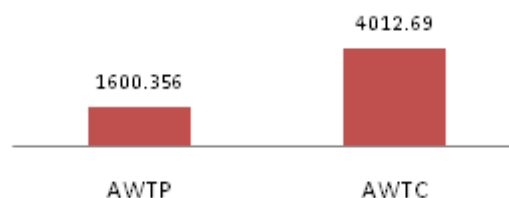


Figure 2: Comparison of AWTP and AWTC for Firing Outside Marriage Halls

Results from Liberty Market (8.4 Average Scale of Noise)

- Extensive use of generators in Liberty market which has become a noisy place surrounding residential area of Gulberg.
- Powerful and noisy generators have been installed by numerous shops from 2.5 KV to 15 KV for commercial usage. Small shops have generators from 1 KV to 2.5 KV but relatively bigger shopping plazas have installed generators from 10 KV to 15 KV to recover electricity shortfall. The scale of noisy area showed that people rated liberty market as the noisy location but the average was still low when compared with model down. These generators were fitted 50 meters away from the plaza so many people were not directly affected by the noise. 80% said that noise from generators disturbs them, 80% suffered from increased heart beat and blood

²The Exxon Valdez oil spill in Prince William Sound was the first case where contingent valuation surveys were used in a quantitative assessment of damages. Use of the technique has spread from there.

pressure while 20% faced headache problems. 60% were exposed to the sound >5hrs and 40% for <5hrs.

Results from Hall Road (8.6 Average Scale of Noise)

- A congested market place with a sea of electronic shops. 100% possessed generators ranging from 1 KV to 5 KV because small sized shops with independent and separately owned generators. 100% used pills to calm down nerves. 60% suffered from increased heart beat and blood pressure while 40% faced headache problems.
- People living on the hall road are much affected by the noise of generators because they live in upper portion of their house and have rented the shops on their ground floors that's why 100% people are affected by its noise. 80% were exposed to the sound >5hrs and 20% for <5hrs.

Results from Model Town (9.2 Average Scale of Noise)

- One of the posh areas of Lahore where high income group lives who can afford and maintain generators of 5KV in their 1-3 kanal houses. 75% of their neighborhood possessed generators. 75% suffered from restlessness and 25% from headache. 75% were exposed to the sound for >5hrs and 25% for <5hrs.
- Ups users are mostly affected by it so they demand for compensation by more than Rs500

Results from Iqbal Town (Residential+ Commercial) (8.5 Average Scale of Noise)

- 80% said that their neighborhood possessed generators and 80% were disturbed by its sound. 60% were exposed to >5 hrs and 40% exposed to <5hrs

Conclusion of this research paper is that the use of generators causes noise pollution and it adversely affects the hearing capability of people living in the noisy areas or near commercial areas where small and large firms use generators during hours of load shedding. Moreover, people living near marriage halls have to face the negative externality in the form of massive firing outside halls in wedding season in particular. Hence, the households near markets and marriage halls face many human health issues like headaches.

REGRESSION RESULTS

Willingness to pay function was estimated for the data obtained from CV technique. Regression results have been shown in the Table 2. The regression results were not found to be spurious as R^2 was less than the value of Durbin Watson. The following model was estimated;

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu_i$$

Where Y=Willingness to Pay

X_1 = Age

X_2 = income

X_3 = Scale of Noise

X_4 = Dummy variable for number of hours exposed to unwanted sound of the generator

X_5 = Dummy variable for the use of pills

Here;

$$D_4 = \begin{cases} 1 = \text{if no of hrs exceeded 5} \\ 0 = \text{if no of hrs less than 5} \end{cases}$$

$$D_5 = \begin{cases} 1 = \text{if people use pills to calm down their nerves} \\ 0 = \text{if people don't use pills to calm down their nerves} \end{cases}$$

The estimated model depicted a negative relationship of all the explanatory variables with willingness to pay and t-stats were insignificant because of Contingent Valuation Technique. Since, CV technique is all based upon how much value people place on a certain thing, it may produce strategic bias, information bias, property rights bias and hypothetical bias, thus, resulting in biased willingness to pay and willingness to be compensated. It is the limitation of contingent valuation technique which may lead to biasedness in the results as the researcher may dominate the opinion of the respondent etc.

Table 1: Regression Results from Data Obtained Through Contingent Valuation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X1(age)	-4.271802	4.255375	-1.003860	0.3325
X2(income)	-0.002156	0.002108	-1.022991	0.3237
X3(Scale of noise)	-45.59387	70.59299	-0.645870	0.5288
X4(no of hrs. exposed to generators)	-62.05442	154.4168	-0.401863	0.6939
X5(use of pills)	-156.0116	140.5634	-1.109902	0.2857
C	926.3496	611.8575	1.513996	0.1523
R-square	0.174903	Durbin Watson	1.986420	

SENSITIVITY ANALYSIS

Table 2: A Sensitivity Analysis for Internalizing a Negative Externality

Total Population of Lahore	12500000
Cost Of Canopy	Rs. 4000
Let 25% People Having Generators	3125000
Total Cost	Rs. 12500000000
Average Willingness to pay	Rs.1752.632
Total benefits	21907900000
Assume WTP is 50% more than estimated	Rs. 876.316
Total Benefit	3505264

The sensitivity analysis shows that if the externality is internalized through a command and control technology, the total benefits of correcting an internalizing the negative externality arising from the noise of generators exceed the total cost of installation of canopy over them.

POLICY CONTEXTS

“In Pakistan, unfortunately there is no legislation to deal with the noise emanating from railway engines, aircraft or airport or industrial or construction activities. At present, there are no national standards for prescribing noise limits for residential areas, industrial areas, commercial areas or silence zones” (Detho, 2012). This study will help Environment Protection Department to revise their policies regarding noise pollution. The enforcement mechanism is weak because

public nuisance laws in Sections 269, 270, 290 and 291 of the Pakistan Penal Code accept complaints about generators causing excessive noise or smoke but a little action is taken against violators who are powerful. Therefore, weak enforcement is another cause of property rights and market failure in the economy. The externality can be internalized if the government necessitates the use of canopies for generators through command and control approach in Phase 1 and emission charges in Phase 2. Government can take a serious action against those who violate the law and use firing as a means to express their joy in weddings. The polluters should be charged fee beyond a certain level of emission. Externality can be internalized if the government necessitates the use of canopies for generators through command and control on technology and take a serious action against those who violate the law and use firing as a means to express their joy in weddings through fully specification of laws.

REFERENCES

1. POSITION PAPER FOR ENVIRONMENTAL QUALITY STANDARDS OF NOISE POLLUTION IN PAKISTAN, PAKISTAN ENVIRONMENTAL PROTECTION AGENCY. Retrieved from http://www.google.com.pk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CBsQFjAA&url=http%3A%2F%2Fwww.environment.gov.pk%2FPRO_PDF%2FNoisePaperGen.pdf&ei=KLJbVOWIMMTkoASGs4DICg&usg=AFQjCNFhX_WqFjRkce-zTRYPAaYjHrwIQ&sig2=6tHZdlAWEGiWq01-i680aA&bvm=bv.78677474,d.cGU
2. Khan 1999, Brief on Environmental Legislation in Pakistan, Policy Brief Series # 7. Retrieved from http://www.google.com.pk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CBsQFjAA&url=http%3A%2F%2Fwww.sdpi.org%2Fpublications%2Ffiles%2FPb7-Brief%2520on%2520Environmental%2520Legislation%2520in%2520Pakistan.pdf&ei=ArNbVOzIM8u4ogTG7IDQDA&usg=AFQjCNFDueDR_SYvHrYIxmZAPPsPYcZYsg&sig2=688SzKy8IayhXkLUj9emvA&bvm=bv.78677474,d.cGU
3. Report on Governing Natural Resources and the Processes and Institutions That Affect Them. Retrieved from http://www.google.com.pk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CBsQFjAA&url=http%3A%2F%2Fwww.iucn.pk%2Fpublications%2FNA%2520Legislation%2520Vol-2.pdf&ei=PrNbVO71Mtb9oQSnqIHgCg&usg=AFQjCNEvfFV_pgNtVpR-6bqCn9ffeVkw5Q&sig2=MUUAH2x8cd7F00WmiXuogw&bvm=bv.78677474,d.cGU
4. Diamond, Peter A.; Hausman, Jerry A. (1994). "Contingent Valuation: Is Some Number better than No Number?" *Journal of Economic Perspectives* 8 (4): 45–64. doi:10.1257/jep.8.4.45. JSTOR 2138338.
5. Bill Mundy (real estate) and Dave McLean, The Addition of Contingent Valuation and Conjoint Analysis to the Required Body of Knowledge for the Estimation of Environmental Damage to Real Estate, *The Journal of Real Estate Practice and Education*, 1998, <http://www.greenfieldadvisors.com/publications/contingentvaluation.pdf>
6. W. Michael Hanemann, 'Valuing the Environment through Contingent Valuation' *The Journal of Economic Perspectives*, Vol. 8, No. 4. (Autumn, 1994), pp. 19-43
7. Paul R. Portney, 'The Contingent Valuation Debate: Why Economists Should Care' *The Journal of Economic Perspectives*, Vol. 8, No. 4. (Autumn, 1994), pp. 3-17

APPENDICES

CONTINGENT VALUATION: NOISE POLLUTION CAUSED BY ELECTRIC GENERATORS AND FIRING OUTSIDE MARRIAGE HALLS

- 1) Your name: _____
- 2) Your age: _____
- 3) Your occupation: _____
- 4) Your monthly income: (optional)_____
- 5) How noisy is the area where you live?

0	10
Quiet, Park	Extremely, Hall Rd

- 6) Does your neighborhood possess electric /diesel/gas generator?
 - a) Yes
 - b) No
 - c) Don't know
- 7) Dose the noise from the electric generators bother you?
 - a) Yes
 - b) No
- 8) Which of the following bothers you most?
 - a) Sound of a radio
 - b) Sound of television
 - c) Sound of a generator
 - d) Firing outside marriage halls
 - e) None
- 9) Do you or any members of your family suffer from these following
 - a) Physiological stress such as blood pressure and increased heart rate
 - b) Restlessness
 - c) Speech interference
 - d) Loss of hearing

- e) Headache
 - f) Adverse effect on reading and problem solving
 - g) Decreased efficiency
 - h) All of the above
- 10) For how many hours /day do you have to face noise pollution caused by generators?
- a) Less than 5 hours
 - b) 10 hours
 - c) 15 hours
 - d) More than 20 hours
- 11) At what time of the day does noise bother you most?
- a) Day time
 - b) Night time
 - c) Both of the above
- 12) Have you ever taken pills or tranquilizers to help you sleep or to calm your nerves?
- a) Yes
 - b) No
- 13) If you could stop the noise by making a payment, how much you would be willing to pay in order stop the noise?
- a) Rs 500
 - b) Rs 1000
 - c) Rs 2000
 - d) Other _____
 - e) Nothing
- 14) What amount you would be willing to accept in compensation of the trouble you are caused by generators nearby?
- a) Rs 500
 - b) Rs 1000
 - c) Rs 2000
 - d) More than Rs 2000

e) Other_____

f) Nothing .

15) If there is any marriage hall near your residence, does firing outside them bothers you?

a)Yes

b) No

16) If you could stop the noise by making a payment, how much you would be willing to pay in order stop the firing outside marriage halls?

f) Rs 500

g) Rs 1000

h) Rs 2000

i) Other _____

j) Nothings

17) What amount you would be willing to accept in compensation of the trouble you are caused by firing outside marriage halls?

g) Rs 500

h) Rs 1000

i) Rs 2000

j) More than Rs 2000

k) Other_____

l) Nothing.

